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NWHI BOTTOMFISH FISHERY 1993 VESSEL ACTIVITIES, COSTS & ECONOMIC RETURNS

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Southwest Fisheries Science Center
Administrative Report H-94-1C

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1993 VESSEL ACTIVITIES, COSTS & ECONOMIC RETURNS

by

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FOREWORD

This report was prepared under contract to the National Marine Fisheries Service (NMFS) Pacific Area Office (PAO) in Honolulu, Hawaii, in cooperation with the Western Pacific Regional Fishery Management Council and the NMFS Honolulu Laboratory. Because the report was prepared under contract, its conclusions do not necessarily represent those of the National Marine Fisheries Service.

The author is currently employed with the Hawaii Pelagic Fishing Vessel Economics research project of the Joint Institute for Marine and Atmospheric Research (JIMAR), a cooperative institute of the University of Hawaii and the National Oceanic and Atmospheric Administration (NOAA).

EXECUTIVE SUMMARY

This study focused on the 12 vessels which had reported bottomfish landings from the Northwestern Hawaiian Islands (NWHI) during the period January, 1993 - November, 1993. Of these 12, 4 were active in the Ho'omalu Zone and 8 in the Mau Zone. Vessel owners and/or captains were surveyed through personal interviews and asked to project their operations to the end of 1993.

Based on this information, all Ho'omalu Zone boats were found to be engaged exclusively in commercial bottomfishing in the Ho'omalu Zone with a 1993 average of 9 trips per vessel. This was calculated to be 73.3% of their potential full time operations.

For the Mau Zone vessels, the average vessel will make 22 trips in 1993, with 12.75 of these targeting commercial bottomfishing in the Mau Zone, 3.38 targeting pelagics or mixed targets in the Mau Zone, .25 commercial non-fishing trips (2 charter trips by one vessel). The remaining 5.63 trips are to the Main Hawaiian Islands targeting commercial bottomfish (.88 trips), recreational purposes (4.5 trips) or commercial non-fishing trips (.25 trips consisting of 2 charter trips by one vessel). Vessels in this zone were calculated as operating at 76% of their full time potential.

An analysis of vessels as classified by size was attempted. However, no single physical vessel characteristic was found to explain more than 42% of the variation in 1993 projected maximum catch rates at a statistically significant level. Thus the data in this report are separated by fishing zone only.

Economic analysis of the costs and returns reported by the NWHI fleet revealed that on average Ho'omalu Zone vessels will realize a 1993 return of $2,238 per vessel while Mau Zone vessels will average a 1993 loss of -$21,947 per vessel. If the Ho'omalu Zone fleet were to operate at a full time level each vessel could achieve an average return of $20,533. However full time operations in the Mau Zone would yield an average loss of -$19,497. If the entire NWHI Bottomfish fishery is considered as a whole (vessels in both zones are averaged together) the average vessel would realize a 1993 loss of -$15,351. Actual operation levels for the entire NWHI as a whole were found to be 75.5% of potential full time fishing days (as defined by survey participants); if the fleet were to operate at a full time level of operations the average vessel would realize a loss of -$8574.

Based on this information, along with the relevant maximum sustainable yields as stated in the Bottomfish Fishery Management Plan (1986), the entire NWHI can economically sustain 14.62 vessels on a part time basis or 12.82 on a full time basis. The Ho'omalu Zone is found to be capable of economically sustaining 7.32 vessels on a part time basis or 6.14 vessels on a full time basis. The Mau Zone can economically sustain 5.14 vessels on a part time basis or 4.36 on a full time basis.

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INTRODUCTION

The Western Pacific Fishery Management Council is considering changes to the Fishery Management Plan for the Northwestern Hawaiian Islands (NWHI) Bottomfish Fishery and has sought current information on operations in this area. This report examines the activity patterns, economic returns and the number of economically sustainable vessels for both the entire NWHI and its components, the limited entry Ho'omalu Zone and open access permit Mau Zone.

FLEET OPERATIONS IN THE NWHI

Fleet entries and exits:

The number of vessels bottomfishing in the NWHI has been declining over the past 3 years. In 1991, 16 vessels were active in this fishery, with 14 of those operating in the Mau Zone and 4 in the Ho'omalu Zone. In 1992 there were 13 active vessels; in 1993 there were 12. Table 1 illustrates the entries and exits for each area for 1992 and 1993 (information for 1991 is unavailable).

Table 1. NWHI fleet entries and exits 1992 & 1993

	Vessel	1992	1993
MAU ZONE			
	A	x	
	B	x	
	C	x	
	D	x	
	E	x	x
	F	x	x
	G	x	x
	H	x	x
	I		x
	J		x
	K		x
	L		x
HO'OMALU ZONE			
	M	x	
	N	x	x
	O	x	x
	P	x	x
	Q	x	x

X indicates vessels which fished in the NWHI Mau or Ho'omalu Zone in the indicated year

This report focuses on those boats that were active in 1993, even though complete data will not be available, for three reasons. First, information on the 1993 activities and operating costs of these boats is the most easily recalled by participants and thus likely to be most accurate. Second, those boats which were active in 1992 but not in 1993 (vessels A - D and vessel M which sank in early 1993) recorded landings of only 14,113 lbs in 1992 while those which were active in 1993 but not in 1992 (vessels I - L) have projected 1993 landings of 128,786 lbs. This large addition to the fishery's total catch is certain to have an important impact on fleet costs and returns. Finally, it seems logical to examine the most current data possible when considering whether management plans should be revised.

Activity patterns:

There are 35 vessels holding 1993 permits for bottomfishing in the NWHI. Of these, 5 have permits for the Ho'omalu Zone (although one sank in early 1993) and the other 30 permits are for the Mau Zone. Of the 4 remaining vessels in the Ho'omalu Zone, only 1 holds a longlining permit. Of the 30 Mau Zone permit holders, 16 also hold longlining permits. One Mau Zone permit holder also holds a permit for lobstering.

Personal interviews with vessel owners and captains were used to collect information on the activity patterns of vessels bottomfishing in the NWHI in 1993 (see Appendix A for a complete copy of this questionnaire).

All 12 active vessels were found to be engaged in either full time bottomfishing or a mixture of bottomfishing, trolling and recreational use, with the exception of 4 trips by 2 vessels for military charters and funerals. No vessel was used in other fisheries (such as longlining or lobstering) in 1993. Tables 2 and 3 summarize the activities of all vessels active in the NWHI in 1993.

It can be seen that the majority of trips were taken with commercial bottomfishing as a target. However, several Mau Zone vessels also reported a small number of trolling trips undertaken when the ono were running. Many vessels trolled incidentally on their way to bottomfishing areas, but only 2 characterized these as "mixed target trips" (used here to designate trips targeting both bottomfish and pelagic species). No Ho'omalu Zone vessels were used for fishing in the MHI or for recreational purposes; 4 Mau Zone boats were used recreationally on occasion, the majority of these being used recreationally less than once every two months for 1 to 2 day fishing trips, typically with the owner and/or the owner's family aboard.

Table 2. 1993 activity patterns for active Ho'omalu Zone vessels

HO'OMALU ZONE TRIPS	Average number of trips	Range	Std. deviation
Commercial Bottomfishing			
All vessels (N=4)	8.75	3 - 12	3.42
Commercial Trolling			
All vessels (N=4)	0.00	0 - 0	0.00
Commercial Mixed Target			
All vessels (N=4)	0.00	0 - 0	0.00
Commercial Non-fishing			
All vessels (N=4)	0.00	0 - 0	0.00
Non-commercial/recreational			
All vessels (N=4)	0.00	0 - 0	0.00
MAIN HAWAIIAN ISLANDS TRIPS			
None			
TOTAL ALL TRIPS			
All vessels (N=4)	8.75	3 - 12	3.42

Table 3. 1993 activity patterns for active Mau Zone vessels

MAU ZONE TRIPS	Average # of trips	Range	Standard deviation
Commercial Bottomfishing			
All vessels (N=8)	12.75	4 - 22	5.40
Owner operated vessels (N=5)	11.80	4 - 20	5.16
Hired captain vessels (N=3)	14.67	10 - 22	5.25
Commercial Trolling			
All vessels (N=8)	1.63	0 - 8	2.74
Owner operated vessels (N=5)	2.40	0 - 8	3.20
Hired captain vessels (N=3)	0.33	0 - 1	0.47
Commercial Mixed Target			
All vessels (N=8)	1.75	0 - 12	3.93
Owner operated vessels (N=5)	0.00	0 - 0	0.00
Hired captain vessels (N=3)	4.67	0 - 12	5.25
Commercial Non-fishing			
All vessels (N=8)	0.25	0 - 2	0.66
Owner operated vessels (N=5)	0.40	0 - 2	0.80
Hired captain vessels (N=3)	0.00	0 - 0	0.00

TOTAL MAU ZONE TRIPS	Average # of trips	Range	Standard deviation
All vessels (N=8)	16.38	7 - 25	5.45
Owner operated vessels (N=5	14.40	7 - 20	3.01
Hired captain vessels (N=3)	19.67	10 - 25	6.85

MAIN HAWAIIAN ISLANDS TRIPS			
Commercial Bottomfishing			
All vessels (N=8)	0.88	0 - 3	1.17
Owner operated vessels (N=5)	0.40	0 - 2	0.80
Hired captain vessels (N=3)	1.67	0 - 3	1.25
Commercial Non-fishing			
All vessels (N=8)	0.25	0 - 2	0.66
Owner operated vessels (N=5)	0.40	0 - 2	0.80
Hired captain vessels (N=3)	0.00	0 - 0	0.00
Non-commercial/recreational			
All vessels (N=8)	4.50	0 - 25	8.00
Owner operated vessels (N=5)	5.60	0 - 25	9.77
Hired captain vessels (N=3)	2.67	0 - 6	2.49

TOTAL MHI TRIPS	Average # of trips	Range	Standard deviation
All vessels (N=8)	5.63	0 - 29	9.31
Owner operated vessels (N=5	6.40	0 - 29	11.36
Hired captain vessels (N=3)	4.33	0 - 9	3.68

TOTAL ALL TRIPS			
All vessels (N=8)	22.00	7 - 44	9.87
Owner operated vessels (N=5)	20.80	7 - 44	11.92
Hired captain vessels (N=3)	24.00	19 - 29	4.08

VESSEL CHARACTERISTICS

Table 4 presents the average physical characteristics of the vessels operating in each area of the NWHI fishery as reported by vessel captains and/or owners during interviews. The one exception is vessel length. Due to the variability of vessel length definitions in use (e.g. waterline length, length overall etc.) this table uses the overall lengths recorded by the local harbormasters as it is felt that this is likely to be both consistent and accurate (mooring fees are charged based on this measure). Hold capacity is presented in terms of the maximum pounds of bottomfish which captains and/or owners believe their vessel holds can carry.

Table 4. Average vessel characteristics for the 1993 active NWHI Bottomfish Fishery

Characteristic:	Entire NWHI (N=12)	Ho'omalu Zone (N=4)	Mau Zone (N=8)
Length overall (in feet)	46.83	53	43.75
Beam (in feet)	13.83	15.7	12.9
Fuel capacity (in gallons)	1,908	2,763	1,481
Maximum range (roundtrip in miles)	2,840	5,333	1,771
Hold capacity (in lbs. of bottomfish)	7,272	15,666	4,125

VESSEL CLASSIFICATION

This study attempted to classify NWHI fishery vessels according to their size or a similar characteristic. This analysis began with an examination of the impact of all 12 known physical and operational characteristics on the **1993 projected maximum catch** for all 12 vessels operating in the NWHI in order to determine if there is any one characteristic by which vessels could be logically separated. The 1993 projected maximum catch (that catch which would result if vessels operated at a full time level of operations) was used rather than the 1993 projected actual catch as the conditions which prohibit full time use (breakdowns, delays and recreational use of the vessel) are not related to the physical characteristics or operational capabilities of the vessels. This **1993 projected maximum catch** was calculated by multiplying the average catch per trip, as stated during interviews, by the maximum number of trips which a vessel would make in a year if there were not excessive breakdowns, delays or recreational use of the vessel (**PMC = C/T * T'**). Table 5 presents the resulting correlations, along with the probabilities that they are statistically significant.

As the first two columns of Table 5 illustrate, the zone fished statistically "explains" 85.51% (r squared = .8551) of the variation in **1993 projected maximum catch.** Although found to be statistically significant, operational characteristics such as the number of trips per year or the average days per trip were felt to be poor choices for vessel size classification and thus further analysis was focused on Zone, and the 4 physical characteristics of Fuel Capacity, Beam, Hold Capacity, and Length. A stepwise multiple regression was used on all vessels in the NWHI fishery as well as on those operating only in the Mau Zone.[1]

The stepwise procedure revealed the order in which variables were added to the equation such that the variable with the highest explanatory power was entered first, followed by the variable with the most explanatory power given the presence of the first etc. Finally, an OLS multiple regression was used for the two areas, with variables entered in the order specified by the stepwise analysis. The results of this final analysis are presented in Table 6.

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[1] Due to the limited number of observations for the Ho'omalu Zone (4), regression analysis would have to be limited to 1 to 2 independent variables. However no single physical characteristic was found to hold explanatory power at a statistically significant level of confidence (see Table 5) and thus no such analysis was done for this zone.

Table 5. Correlations with **1993 projected maximum catch**

VARIABLE:	Entire NWHI			Ho'omalu Zone			Mau Zone		
	r	Prob. |r|=0		r	Prob. |r|=0		r	Prob. |r|=0	
Length (n=12)	0.5000	0.0980	*	0.0934	0.9070		-0.3564	0.3860	
Beam (n=12)	0.7786	0.0030	**	0.0163	0.9840		0.2737	0.5120	
Fuel capacity (n=12)	0.2855	0.3680		-0.0998	0.9000		-0.6186	0.1020	
Range (n=10)	0.5875	0.0740	*	-0.5086	0.4910		-0.7970	0.0180	**
Hold capacity (n=11)	0.8903	0.0000	**	-0.7792	0.2210		0.6473	0.0830	*
Number of crew (n=11)	0.6755	0.0230	**	0.8753	0.1250		0.6441	0.0850	*
Avg. catch/trip (n=12)	0.9573	0.0000	**	0.4007	0.5990		0.7112	0.0480	**
Fishing days/trip (n=11)	0.9101	0.0000	**	0.7063	0.2940		0.5377	0.1690	
Avg. days/trip (n=11)	0.9157	0.0000	**	0.8573	0.1430		0.5077	0.1990	
Avg.catch/fishing day (n=11)	0.9243	0.0000	**	0.9629	0.0370	**	0.6912	0.0580	*
Maximum trips/year (n=12)	-0.5041	0.0950	*	0.8325	0.1680		0.3333	0.4200	
Zone fished (n=12)	-0.9226	0.0000	**	N/A	N/A		N/A	N/A	
				max n = 4			max n = 8		

* indicates signrificance at a 90% confidence level

** indicates significance at a 95% confidence level

Note: Correlation is a statistic which indicates how one variable (e.g. catch) changes with another variable (e.g. vessel length). A correlation coefficient of r=1.0 indicates a 100% or 1-to-1 relationship; r=0 indicates no relationship; r<0 indicates a negative relationship. A probability (Prob |r|=0) greater than 10% generally indicates a statistically unreliable relationship. Squaring the coefficient (R squared) indicates how much of the variation in one variable is explained by the other.

Table 6. Multiple regression of fleet characteristics

Entire NWHI

Dependent variable: **1993 projected maximum catch**

Independent variables:	Parameter	T value		Sequential R squared
Zone	-57301.3000	-4.62	**	85.19%
Fuel capacity	-13.3752	-3.64	**	87.24%
Beam	13242.8600	3.00	**	94.96%

Constant: -58654.29
Adjusted R squared = 92.80%
n = 10

Mau Zone

Dependent variable: **1993 projected maximum catch**

Independent variables:	Parameter	T value		Sequential R squared
Hold capacity	5.3563	2.74	**	41.90%
Fuel capacity	-10.7226	-2.60	**	75.32%

Constant: 28853.3
Adjusted R squared = 65.45%
n = 7

* indicates significance at a 90% confidence level
** indicates significance at a 95% confidence level

As may be expected, in the case of the entire NWHI fishery, the variable with the most explanatory power is again Zone (the average **1993 projected maximum catch** for the Ho'omalu Zone is 110,700 lbs/vessel, for the Mau Zone it is 53,491 lbs/vessel - see Tables 8 and 9). Also significant for this area are Fuel Capacity, which adds 2.05% to the overall explanatory power of the equation (sequential R squared) and Beam which adds another 7.72%.

When the Mau Zone is examined alone, Hold Capacity is found to have the highest explanatory power (41.9%), followed by Fuel Capacity which adds another 33.42% to the overall explanatory power of the equation.

Although significant differences may be seen in the average size of vessels in the Ho'omalu versus Mau Zones, an analysis of the entire NWHI fleet which did not consider the variable Zone would be inappropriate as the two groups of vessels operate under very different conditions. The major difference is in the bottomfish catch per trip, which varies from an average of 9,300 lbs/trip for Ho'omalu Zone vessels to an average of 1,371 lbs/trip for Mau Zone vessels. Thus an analysis which attempts to explain variations in catch must include those variations due to the zone fished.

In conclusion, when taken as a group a vessel's physical characteristics do explain a large portion of the variation in **1993 projected maximum catch** but no one physical characteristic could be found to explain more than 42% of this variation at a statistically significant level and thus vessels are classified by zone but not by size throughout this report.

VESSEL ECONOMICS

Information on the operations and associated costs of bottomfishing in the NWHI was obtained through personal interviews with the owners and/or captains of 11 of the 12 vessels which were active in 1993 (one respondent chose not to respond to these questions). Revenues are based on the number of trips projected by respondents through the end of 1993 together with their average catch per trip and the expected 1993 output prices.[2]

Participants were surveyed as to their investments in their vessels (purchase price plus the cost of additions) and a "capital" cost was calculated as a fixed cost. This equals the investment amount multiplied by the June, 1993 long term U.S. Treasury bond rate of 6.55%. This capital cost is known as "opportunity cost" and may be thought of as the return on the investment amount which is

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[2] Calculated from Hawaii Department of Aquatic Resources (HDAR) prices as follows:
$[1993_{Jan.-June} + (1993_{Jan.-June} * (1992_{July-Dec.}/1992_{Jan.-June}))]/2$

foregone through the use of the funds to purchase and improve the vessel. This long-term interest rate represents a low risk return on investment, while fishing represents a higher risk (with potentially higher returns). No attempt has been made to calculate a risk "premium" to the interest rate.

No allowances for depreciation were taken as it was observed that, if adequately maintained, a vessel's useful life is virtually unlimited, or at least beyond the time horizon of contemporary investment profiles. In addition, no loan payment costs were included as the method of calculating capital costs is independent of financing arrangements. These decisions represent the norm in economic, as compared to financial analysis and are discussed later.

Other items in fixed costs are the average amounts spent on annual repairs and drydock costs, vessel insurance, mooring fees and other administrative costs. Annual repairs include both annual repairs (redoing electronics, overhauling engines etc.) and drydock expenses. In general, vessels had both vessel and liability insurance.

Respondents were also surveyed as to both the quantities and the costs of fuel, oil,ice, bait food and miscellaneous fishing supplies (weights,line, swivels, hooks gloves etc.) used per trip. Information on quantities used was provided by all 11 respondents; where actual costs were not available, the average prices from local retailers (October 1993) was used to calculate costs. As the majority of survey participants reported selling their catch through the local fish auction house, the auction's average handling charge of 10% of gross revenue was used throughout this study. Maintenance costs represent the average costs for minor repairs and painting on a per trip basis. Gear is also calculated on a per trip basis and refers to large items such as anchors and anchor chains.

Data on how wages are paid (i.e. what percentage the captain and crew receive) was reported for a majority of vessels, for those which did not reveal this information the average rates for the relevant zone were substituted. All captains and crew members were found to be hired as independent contractors, and thus no health, unemployment, social security or workmen's compensation insurance payments were made.

Table 7 presents the average costs per trip and per fishing day for all 11 NWHI vessels which provided adequate information to construct income statements. Also appearing in Table 7 are the 1993 projected annual averages (termed "actual annual") based on projected operations for 1993 as well as 1993 maximum annual averages (termed "maximum annual"). As above, these maximum annual averages were calculated using the number of trips which respondents felt they would make in a year if there were not an unusual number of breakdowns or delays, or in the case of Mau Zone vessesl, any recreational use. The resulting maximum annual trip days (229) is considered to be a full time level of operations. On average, vessels in the NWHI were found to be operating at 75.5% of their full time potential in 1993. As Table 7 illustrates, the

Table 7. Average data of 1993 active NWHI vessels

	Annual operating & financial data	Per trip	Per fishing day	Per day at sea	Actual Annual	Maximum Annual
1. Operating Characteristics						
Commercial trips	15.00				15.00	20.00
Bottomfishing	12.36				12.36	16.48
Other commercial	2.64				2.64	3.52
(Non-commercial)	2.82				4.64	
Trip days		11.55			173	229
Fishing days		6.75			101	133
Travel days		4.79			72	96
Total Catch		2,956	438	256	44,340	59,593
Bottomfish		2,717	402	235	40,749	53,491
Other species		239	35	21	3,591	6,102
2. Gross Revenue						
Avg. bottomfish price	$3.25					
Avg. pelagic price	$3.06					
Revenue		$9,561	$1,416	$828	$143,422	$192,518
3. Costs						
Fixed Costs						
Investment	165,455					
Capital factor	6.550%					
Capital		802			12,028	12,028
Annual repairs		807	120	70	12,109	12,109
Vessel insurance		873	129	76	13,100	13,100
Administrative		314	47	27	4,710	4,710
Other		33	5	3	491	491
Total Fixed Costs		$2,829	$419	$245	$42,438	$42,438
Operating Costs						
1. Shared costs						
Fuel & Oil		827	122	72	12,403	16,717
Ice		235	35	20	3,528	4,885
Bait		396	59	34	5,935	7,848
Food		481	71	42	7,222	9,531
Supplies		445	66	39	6,673	8,774
Sub-total		$2,384	$353	$206	$35,762	$47,755
2. Other Operating Costs						
Handling	10.00%	956	142	83	14,342	19,252
Maintenance		591	88	51	8,864	14,359
Gear		171	25	15	2,559	3,585
Other		8	1	1	116	150
Sub-total		$1,725	$256	$149	$25,880	$37,346
3. Wages						
# of Crew (excluding captain)	1.64					
Per crew share	14.62%					
Captain share	27.15%					
Income per crew		1,043	154	90	15,640	19,909
Income of captain		1,709	253	148	25,628	35,548
Sub-total		$3,646	$540	$316	$54,692	$73,553
Total Operating Costs		$7,756	$1,149	$672	$116,335	$158,654
Total costs		$10,585	$1,568	$917	$158,773	$201,092
4. Net Revenue		($1,023)	($152)	($89)	($15,351)	($8,574)

average vessel operating in the NWHI is not making an economic profit when calculated on a per trip, actual annual (part time) or maximum annual (full time) basis.

Tables 8 and 9 present similar averages for the Ho'omalu and Mau Zones. In the Ho'omalu Zone (Table 8) vessels were found to be operating at 73.3% of their full time potential (263 days/year). On average, vessels in the Ho'omalu Zone in 1993 are making a profit on a per trip, actual annual or part time basis as well as on a maximum annual or full time basis.

Table 9 illustrates the averages for the 8 Mau Zone vessels which were active in 1993. For this zone 221 annual trip days is considered to be a full time level of operations. On average, vessels in the Mau Zone were found to be operating at 76% of their full time potential in 1993. The average vessel operating in the Mau Zone in 1993 is not making a profit on a per trip, actual annual (part time) or maximum annual (full time) basis.

Economic versus financial analysis:

There are several major differences between an economic analysis and a financial analysis. A financial analysis is concerned with actual cash flows while an economic analysis also examines additional hidden costs such as opportunity costs and depreciation. On a financial basis, the **capital cost** of owning these vessels could be considered to be the loan payments made by those vessel owners with loans outstanding (4 or 33% of the active fleet). The fleet average loan payment is $50,710 per year, with a Ho'omalu Zone average of $82,800 per year and a Mau Zone average of $18,620 per year. For these 4 vessels the financial situation is worse than the average portrayed here. For many of the remaining vessels which are completely paid off, a financial analysis would show a more positive cash flow. Although a financial analysis does illustrate the day to day situation faced by vessel operators it ignores the "sunk" (investment) costs and would not represent a solid basis on which to make operational or policy decisions. The omission of capital costs would result in the portrayal of a $150,000 dollar investment which returns a positive cash flow of $10,000 per year as being as profitable as a $25,000 dollar investment which yields the same return, when in fact the rates of return on investment, and thus overall profitability, are quite different. By finding the full investment value of fishing vessels and calculating an average long term yield on that investment, this economic analysis attempts to put all investments on a level playing field from a public policy perspective.

Depreciation is a concept which is used in two different ways. For tax purposes, depreciation is a method of deducting the purchase price of vessels over a number of years, the calculation of this deduction begins again each time the vessel is purchased by a new owner. The second use of the concept of depreciation is in financial analyses, where one seeks to calculate the value of investment. Here one estimates the annual decrease in the physical

Table 8. Average data of 1993 active Ho'omalu Zone vessels

	Annual operating & financial data	Per trip	Per fishing day	Per day at sea	Actual Annual	Maximum Annual
1. Operating Characteristics						
Commercial trips	9.00				9.00	12.33
Bottomfishing	9.00				9.00	12.33
Other commercial	0.00				0.00	0.00
(Non-commercial)	0.00				0.00	
Trip days		21.78			196	263
Fishing days		13.22			119	156
Travel days		8.56			77	107
Total Catch		9,444	714	434	85,000	115,000
Bottomfish		9,300	703	427	83,700	110,700
Other species		144	11	7	1,300	4,300
2. Gross Revenue						
Avg. bottomfish price	$3.25					
Avg. pelagic price	$3.06					
Revenue		$30,667	$2,319	$1,408	$276,003	$372,933
3. Costs						
Fixed Costs						
Investment	233,333					
Capital factor	6.550%					
Capital		1,831			16,483	16,483
Annual repairs		1,294	98	59	11,645	11,645
Vessel insurance		3,200	242	147	28,800	28,800
Administrative		751	57	34	6,760	6,760
Other		200	15	9	1,800	1,800
Total Fixed Costs		$7,277	$550	$334	$65,489	$65,489
Operating Costs						
1. Shared costs						
Fuel & Oil		1,483	112	68	13,347	17,957
Ice		444	34	20	3,996	6,063
Bait		1,011	76	46	9,097	11,847
Food		1,378	104	63	12,400	15,733
Supplies		1,194	90	55	10,750	11,917
Sub-total		$5,510	$417	$253	$49,590	$63,517
2. Other Operating Costs						
Handling	10.00%	3,067	232	141	27,600	37,293
Maintenance		1,556	118	71	14,000	27,333
Gear		434	33	20	3,905	4,148
Other		0	0	0	0	0
Sub-total		$5,056	$382	$232	$45,505	$68,775
3. Wages						
# of Crew (excluding captain)	2.67					
Per crew share	10.93%					
Captain share	20.83%					
Income per crew		3,028	229	139	27,256	34,145
Income of captain		4,718	357	217	42,459	63,210
Sub-total		$12,576	$951	$577	$113,182	$154,600
Total Operating Costs		$23,142	$1,750	$1,063	$208,277	$286,892
Total costs		$30,418	$2,301	$1,397	$273,765	$352,380
4. Net Revenue		$249	$19	$11	$2,238	$20,553

Table 9. Average data of 1993 active Mau Zone vessels

	Annual operating & financial data	Per trip	Per fishing day	Per day at sea	Actual Annual	Maximum Annual
1. Operating Characteristics						
Commercial trips	17.25				17.25	22.88
Bottomfishing	13.63				13.63	18.07
Other commercial	3.63				3.63	4.81
(Non-commercial)	3.88				3.88	
Trip days		9.80			169	221
Fishing days		5.49			95	124
Travel days		4.32			75	97
Total Catch		1,686	307	172	29,092	38,815
Bottomfish		1,429	260	146	24,642	32,038
Other species		258	47	26	4,450	6,778
2. Gross Revenue						
Avg. bottomfish price	$3.25					
Avg. pelagic price	$3.06					
Revenue		$5,664	$990	$554	$93,703	$124,862
3. Costs						
Fixed Costs:						
Investment	140,000					
Capital factor	6.550%					
Capital		600			10,358	10,358
Annual repairs		712	130	73	12,283	12,283
Vessel insurance		418	76	43	7,213	7,213
Administrative		228	42	23	3,941	3,941
Other		0	0	0	0	0
Total Fixed Costs		$1,959	$357	$200	$33,795	$33,795
Operating Costs:						
1. Shared costs						
Fuel & Oil		699	127	71	12,049	16,252
Ice		194	35	20	3,353	4,443
Bait		275	50	28	4,749	6,349
Food		306	56	31	5,281	7,205
Supplies		298	54	30	5,144	7,596
Sub-total		$1,773	$323	$181	$30,576	$41,845
2. Other Operating Costs						
Handling	10.00%	543	99	55	9,370	12,486
Maintenance		402	73	41	6,938	9,494
Gear		119	22	12	2,054	3,374
Other		9	2	1	159	206
Sub-total		$1,074	$196	$110	$18,521	$25,560
3. Wages						
# of crew (excluding captai	1.125					
Per crew share	17.58%					
Captain share	29.52%					
Income per crew		654	119	67	11,284	14,571
Income of captain		1120	204	114	19,316	25,175
Sub-total		$1,899	$346	$194	$32,759	$43,160
Total Operating Costs		$4,745	$865	$484	$81,856	$110,565
Total Costs		$6,704	$1,222	$684	$115,651	$144,359
4. Net Revenue		($1,272)	($232)	($130)	($21,947)	($19,497)

value of the original investment (the vessel) due to wear and tear, etc. This investment cost is then adjusted for the decline in value each year, and the capital cost refigured based on this adjusted amount. Theoretically the amount by which the investment depreciates (decreases in value) is easily calculated as the investment cost divided by some number of years (the vessel's useful life). In practice the useful life of a vessel is difficult to determine - some of the vessels in this survey were over 40 years old and still fully functioning. This type of depreciation calculation is often used when compiling financial balance sheets, but is not commonly used in economic analyses. It is felt that the method of analysis used throughout this report (capital costs figured on the full investment cost with no depreciation allowances taken) most accurately reflects the situation of the NWHI fleet for economic policy purposes.

Economically and biologically optimal fleet size:

Table 10 illustrates the number of vessels currently active in the NWHI as well as their average 1993 projected catch. Also appearing in Table 10 are the number of vessels which each area could biologically sustain (using the relevant MSY as defined in the 1986 Bottomfish Fishery Management Plan), and the catches which vessels would need to average in order to break even (annual costs equal annual returns). Finally, Table 10 presents the number of vessels which each area could economically sustain while staying within the same MSY.

In order to break even while operating on a part time basis, the average NWHI vessel would have to increase its annual bottomfish catch by 30.35% to 53,117 lbs. In the case of full time operations, annual catch would have to increase by 13.24% to 60,573 lbs/vessel. Based on this information, along with the total NWHI maximum sustainable yield (MSY) of 776,381 lbs/year, this fishery can economically sustain 14.62 vessels on a part time basis or 12.82 vessels on a full time basis.

In order to break even while operating on a part time basis, the average annual bottomfish catch of vessels in the Ho'omalu Zone would have to decrease by 1.68% to 82,293 lbs/vessel. In the case of full time operations, the average vessel would break even with an annual catch of 98,063 lbs/vessel, a decrease of 11.42%. Based on this information, along with the Ho'omalu Zone maximum sustainable yield (MSY) of 602,406 lbs/year, this zone can economically sustain 7.32 vessels on a part time basis or 6.14 vessels on a full time basis.

For vessels in the Mau Zone operating on a part time basis, annual catch of bottomfish would have to increase by 37.32% to 33,839 lbs/vessel in order for the average vessel to break even. In the case of full time operations, the average vessel would break even with an annual catch of 39,894 lbs/vessel, an increase of

Table 10. Summary of 1993 annual and breakeven annual catches & numbers of economically sustainable vessels

	Entire NWHI MSY = 776,381 lbs.	Ho'omalu Zone MSY = 602,406 lbs.	Mau Zone MSY = 173,975 lbs.
Number of vessels actively fishing in 1993:			
At maximum (full time) operations level	9.06	2.93	6.08
At actual (part time) operations level	12.00	4.00	8.00
Avg. 1993 projected annnual bottomfish catch per vessel:			
At maximum (full time) operations level	53,491	110,700	32,038
At actual (part time) operations level	40,749	83,700	24,642
Number of biologically sustainable vessels:			
At maximum (full time) operations level	776,381/53,491 = 14.51	602,406/110,700 = 5.44	173,975/32,038 = 5.43
At actual (part time) operations level	776,381/40,749 = 19.05	602,406/83,700 = 7.20	173,975/24,642 = 7.06
Avg. annual bottomfish catch per vessel required to break even:			
At maximum (full time) operations level	60,573 (+13.24%)	98,063 (-11.42%)	39,894 (+24.52%)
At actual (part time) operations level	53,117 (+30.35%)	82,293 (-1.68%)	33,839 (+37.32%)
Number of economically sustainable vessels:			
At maximum (full time) operations level	776,381/60,573 = 12.82	602,406/98,063 = 6.14	173,975/39,894 = 4.36
At actual (part time) operations level	776,381/53,117 = 14.62	602,406/82,936 = 7.32	173,975/33,839 = 5.14

Source for Ho'omalu and Mau Zone MSY is the Bottomfish Fishery Management Plan, 1986.
Entire NWHI MSY = Ho'omalu Zone MSY + Mau Zone MSY.

24.52%. Based on this information, along with the Mau Zone maximum sustainable yield (MSY) of 173,975 lbs/year this zone can economically sustain 5.14 vessels on a part time basis or 4.36 on a full time basis. These results are based on the assumption that a decrease in the number of vessels fishing would lead to an increase in average per vessel annual catch for those vessels which remain.

Comparisons with previous studies:

The question of the economically optimal fleet size for the NWHI has been addressed several times before over the last 5 years. Most recently Pooley (letter to Management Council, August, 1993) proposed that the optimal number of vessels for the NWHI as a whole was 9.36; for the Ho'omalu Zone it was 6.99 and for the Mau Zone it was 2.22. These figures are based on a full time operations level as part time participation was not directly addressed in this study. The methodology of this study was very similar to that used here, however vessels were not separated by zone for either data collection or analysis and the economic cost data collected was based on information collected in 1989 and updated only for inflation. Major differences in the findings of this study and those presented here arise from differences in output prices (29% higher today), the interest rate used to calculate capital costs (8.3% vs. today's 6.55%) and operating costs (generally higher today). While not uniformly attributable to any one factor, these differences combine to affect the economics of each zone and thus the changes in annual catch required to break even, as well as the optimal number of vessels economically sustainable for each area.

Comparisons with fishing in the MHI:

A direct comparison with MHI fishing is difficult as both revenue and a portion of operating costs (handling charges and crew shares) are dependent on the catch achieved. Other operating costs such as fuel and oil are likely to be reduced as running time from Honolulu to the area of the MHI just north of Kauai is estimated to be 16 hours while a time of 48 hours is needed to reach Necker, and 2a trip to the French Frigate Shoals averages 60 hours one way. However, the average bottomfish catch per MHI trip for these vessels is unknown. What is known is that NWHI Bottomfish fishery participants interviewed generally replied that it's not worth their time to fish in the MHI as it takes too long to catch a full load of fish, and that most vessels fishing in the MHI are much smaller than those in the NWHI fishery.

MOTIVATIONS

Given the above negative returns, participants were surveyed as to their attitudes towards the profits which they are making. As may be expected, their responses varied with their ownership status. These responses are summarized in Table 11.

Table 11. Attitudes of 1993 active NWHI vessel captains and owners

	Do you feel that you are making a decent living/return operating this vessel?				Did you show a profit on your 1992 tax return from this vessel?		Is this vessel paid off?		What percent of your family's income does this vessel provide?		
MAU ZONE - 1993	Yes	Fair	No	Not yet	Yes	No	Yes	No	100	50%	<50%
Hired captain N = 3											
Owner			67%			67%	67%	33%		33%	67%
Captain	33%	67%			N/A	N/A	N/A	N/A	67%	33%	
Owner-operated N = 5											
Owner	20%		60%	20%	40%	20%	60%	40%	80%	20%	20%
HO'OMALU ZONE - 1993											
All vessels N = 4	25%			25%	25%	25%		50%	50%	25%	

Clearly, hired vessel captains feel that they are making at least a fair living from these vessel operations. This is not surprising as otherwise they would not be likely to continue. Vessel owners, on the other hand, are largely unsatisfied with the returns which they are achieving, and in fact many did not show a profit from their vessel operations on their 1992 tax returns. For all vessel operators, this operation generally provided at least 50% of their family's income, commonly through the money received as captain's share rather than through an overall profit. Again, the outlook for bottomfish industry participants is not good. Why do they continue in this business? Table 12 illustrates the motivations cited by respondents.

The highest number of responses for the most important motivation among owner operators in the Mau Zone was that their vessel provides a primary source of income, followed equally by enjoyment of the lifestyle, long term investment goals, and seeking to cover a portion of the vessel's fixed costs.

Among hired captains in the Mau Zone, enjoyment of the lifestyle offered by fishing was cited most frequently as being most important, followed by the provision of captains' primary source of income. For the owners of these vessels, most important motivations were divided equally between long term investment goals, recreational purposes and plans to take over vessel operations.

As there is only 1 Ho'omalu Zone vessel with a hired captain (the owner of which did not respond to this question), the responses of all 4 vessels are presented together. For this group, the dominant motivation cited as being most important was that the vessel is the primary source of income for the captain and owners.

Table 12. Motivations of 1993 active NWHI vessel captains and owners

MAU ZONE - 1993

	Owner-operated vessels N = 5		Hired captain vessels N = 3			
	Owner/captain		Captain		Owner	
	Most important	Somewhat important	Most important	Somewhat important	Most important	Somewhat important
Enjoy the lifestyle	20%	60%	67%	33%	N/A	N/A
Enjoy the work itself		20%		67%	N/A	N/A
Primary source of income	60%	40%	33%			
Source of additional income		20%				33%
No other source of employment		20%				
Long term family tradition				33%		
Long term investment goals	20%	20%	N/A	N/A	33%	33%
Tax write off			N/A	N/A		33%
Cover a portion of fixed costs	20%		N/A	N/A		
Recreational purposes			N/A	N/A	33%	
Plan to operate it myself	N/A	N/A	N/A	N/A	33%	

HO'OMALU ZONE - 1993

	All vessels N = 4	
	Most important	Somewhat important
Enjoy the lifestyle		50%
Enjoy the work itself	25%	25%
Primary source of income	50%	25%
Source of additional income		
No other source of employment		
Long term family tradition		50%
Long term investment goals		50%
Tax write off		
Plan to operate it myself		
Cover a portion of fixed costs		
Recreational purposes		

PROPOSED POLICY CHANGES

Participants were also surveyed as to their opinions concerning possible changes to the NWHI bottomfish fishery management plan. The following comments are listed in order of frequency of response within each category.

1993 ACTIVE HO'OMALU ZONE VESSEL CAPTAINS & OWNERS:

Question: Should entry to the Mau Zone be limited?

- Only if there is evidence that it is being overfished. (2)
- No. (1)
- Yes. (1)

Question: If entry to the Mau Zone is limited, what should be the entry criteria?

- There shouldn't be a required number of landings (lbs/year) because it will force people to fish more than they might otherwise and lead to further stress on fish stocks. (2)
- There should be a required number of landings (lbs./year) but the requirement shouldn't be too high or people will be forced to fish more than they would otherwise. (1)
- Only full time active vessels should be allowed in, not those which make only 3 trips per year. (1)

Question: Should the Mau and Ho'omalu Zones be combined?

- No, there would be too many boats and they might stress fish stocks. (3)
- No opinion. (1)

Question: If entry to the Mau Zone is limited, should the permits be transferable?

- Yes. (1)
- Yes but only one time. (1)
- Yes but they should have to stay with the boat and not be sold separately. (1)

1993 ACTIVE MAU ZONE VESSEL CAPTAINS & OWNERS:

Question: Should entry to the Mau Zone be limited?

- Yes. (5)
- No, the number of active boats is small (2)
- Yes, fish numbers have been declining. (1)
- Yes, limit entry and then observe activity levels and consider combining zones. (1)
- Yes but enlarge Mau Zone to include French Frigate because the number of Mau Zone permit holders is larger than the number of Ho'omalu Zone permits yet the Mau Zone is smaller than the Ho'omalu Zone. (1)

Question: If entry to the Mau Zone is limited, what should be the entry criteria?

- Must be active by the end of 1993. (1)
- Enforce proposed 1991 cut off date with a "use it or lose it" approach. (1)
- "Use it or lose it" combined with area closures (1)
- Must be active by the end of 1993 and requalify each year on "use it or lose it" basis. (1)
- "Use it or lose it" but with smaller landing requirements than are used for the Ho'omalu Zone. (1)
- Must be active. (1)
- Only those vessels whose captains and/or owners have Hawaiian blood should be allowed in. (1)

Question: Should the Mau and Ho'omalu Zones be combined?

- No, the Mau Zone would be quickly devastated by larger Ho'omalu Zone boats. (2)
- Yes, as long as not too many boats are allowed in. (1)
- No, small boats would upgrade and the big boats would overfish it. (1)
- Yes because then weather, boat capabilities and market conditions can govern where boats fish rather than artificial boundaries. (1)
- Perhaps, based on biological conditions and observed activity levels. (1)
- It wouldn't be possible because Ho'omalu Zone permit holders would object. (1)
- No opinion. (1)

Question: If entry to the Mau Zone is limited, should permits be transferable?

- Yes, but only with the vessel. (2)
- No because if you have to pay for a permit than you have an incentive to fish more than you might otherwise. (1)
- Yes, permits need to be transferable but there could be difficulties for local people might be locked out of the industry due to high permit prices. (1)
- Not now while there are so many permit holders, maybe later, but than only with the vessel and with no upgrading of vessels allowed. (1)
- No because than the number of permit holders will decrease over time. (1)
- Yes, either with or without the vessel. (1)
- Yes but only if there is a requirement that vessels are active in order to get the permit in the first place. (1)

OTHER PROBLEMS OR ISSUES

The last question asked of survey participants was if they had encountered or could forsee any problems or issues concerning either their own operation or for the NWHI Bottomfish Fishery as a whole. Their responses are presented here in order of the frequency with which they were mentioned.

1993 ACTIVE HO'OMALU ZONE VESSEL CAPTAINS & OWNERS:

- Decisions on fishery management should be based on biological conditions alone, if fishermen are continuing to fish despite losing money that's their business. (1)
- Immigrant fishermen shouldn't be subsidized while U.S. fishermen are not. (1)
- There is too much regulation, observers and fish reports slow down fishing effort.(1)
- There are too many boats in both zones. (1)
- Imported fish are retailed as "local" fish. (1)
- There should be a surcharge or tariff on imported fish. (1)
- Have encountered problems with permit transferability when buying or selling a vessel. (1)
- It takes more effort now to catch fish. (1)
- Fish prices are too low, don't rise with other costs. (1)
- Too much accounting and paperwork. (1)
- It takes more effort now to catch fish. (1)
- Too much accounting and paperwork. (1)
- Have to fish longer trips than in 1990 because it's harder to catch fish now. (1)
- Insurance prices have almost doubled since 1990. (1)

1993 ACTIVE MAU ZONE VESSEL CAPTAINS & OWNERS:

- Imports (especially onaga and ahi) are driving down fish prices.(3)
- Need more enforcement to keep out trolling (longline) vessels who don't have Mau Zone permits. (2)
- Pressure on fish stocks isn't a problem. (1)
- It would be good to have another auction house to provide competition to U.F.A. They always sell the bottomfish last when buyers are tired and broke. (1)
- Should let certain fishing areas rest for a while (biologica81 studies could determine the optimum time) in order to ensure long term sustainability. (1)
- Foreigners get better boats and equipment which helps them 2 expand more of their fishing. In the meantime, local boys struggle to maintain their fishing areas and they seem to be surrounded by outsiders. We locals would like to know how the foreigners are able to obtain better or newer vessels.(1)
- Fish are no longer abundant, there is overfishing. (1)
- Vessel improvements are too expensive, not making enough money. (1)
- Hard to catch enough fish. Weather conditions make only 6 months of each year favorable for fishing. (1)
- Worried about Mainland boats entering the fishery, especially if zones are opened up. (1)
- Need more observers and biological studies. Also more studies on fishing effort. (1)
- Sharks eat the catch. (1)
- Hard to find qualified crew who don't drink/drug on the boat.(1)

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APPENDIX A - Survey Questionnaire

Purchase price of boat

OR if homebuilt what was the cost to build it? Does this include labor?

Cost of additions - does this include labor cost?

Current value of boat - estimated or appraised

Ownership of boat

- sole owner (may include immediate family)
- partnership (with someone outside immediate family)
- corporate ownership - with outside stockholders?
  - S corporation
  - other
- leased from another owner

Is this vessel completely paid off?

If not, what was the original amount borrowed?

What was the original length of the loan?

How much time is remaining?

Where is the loan from ?
(ex. local bank/credit assn., mainland bank/credit assn., family, gov't agency)

Do you own any other fishing vessels?

How many are commercial fishing vessels?

How do you decide when to go out?

How do you decide where to go?

How do you decide when to come back in? (constraining factor, what defines capacity, what is maximum possible # of days)

How long does it take to turn around between trips?

Do you think that you fish as much as possible or could you go more?

Describe a typical trip: (what year are you talking about?)
Note times involved if possible-

Destination?

How many days total?

How many days fishing?

Trolling on the way out? In?

Bottomfishing on the way out? In?

What is your average catch per trip (pounds)
range

What percentage of your average catch per trip is bottomfish?
range

How do you decide how much to pay the crew?
the captain?

(Do they get additional amounts beyond their share?)

Does a certain percentage go to the boat or owner?
How do you decide how much?

Have their been significant changes since 1990?

COSTS PER TRIP:

# of days total

	Unit	Number	Cost/unit	Total cost
Fuel	gallons			
Engine Oil -	weight?			
Hydraulic Oil -				
Ice -	300 lb. blocks			
Freon/other refrigerant -				
Bait				
squid	60 lb. case			
anchovy	25 lb. case			
opelu	22 lb. case			
saba	22 lb. case			
sanma	22 lb. case			
other				

Fishing supplies - hooks, line, swivels, weights etc.

Other gear - anchor, anchor chain, other deck gear

Provisions - food

Do you always buy from the same places, get special prices?

Other costs:

(monthly) maintenance/repairs - (ex. change oil and filters, fix anything broken) what does this involve? Is it done every trip or just as needed, about how often are various things done?

dry dock - what does this involve? Is it done every year? How do you decide whether to go for it?

annual maintenance/repairs - (ex. repair or overhaul engine, repaint bottom, redo deck, repair electronics) What does this involve, are certain things done every year, about how often are various things done?

mooring fees/month

boat loan payments/month

insurance/month

- vessel only
- personnel (liability)
- health insurance for captain and/or crew

Other major or miscellaneous costs:

Are there any costs which I haven't included?

Do you captain this vessel only?

For how long have you captained this vessel?

How many crew members do you usually take (including yourself)?

Do family members ever work as crew? If so, how many work regularly?

Primary purpose information for NWHI -

	1993	1992
Northwestern Hawaiian Islands		
Bottomfish Trips to Mau/Ho'omalu Zone:	____	____
Other Fishing Trips to Mau/Ho'omalu Zone: (e.g, targeting *ono, tuna, shark, lobster*)	____	____
Mixed target Fishing Trips to Mau/Ho'omalu Zone: (e.g., targeting bottomfish and other species)	____	____
Other Trips to Mau/Hoomalu Zone: (e.g., supplying other vessels, charter, where?)	____	____
Mixed Trips to NWHI (where?): (e.g., fishing and other purposes)	____	____
Total NWHI Trips	1993	1992

IF this vessel took no trips in the NWHI in 1993, why do you keep the permit?

Is this 1993 projection significantly different from what you did in 1992?

In what way?

Do you ever fish the Main Hawaiian Islands and the NWHI in the same trip?

On the way out?

On the way in?

What percent of the total trips above included MHI fishing?

Primary purpose information for MHI only -

	1993	1992
Main Hawaiian Islands (MHI)		
Commercial Bottomfish Trips	____	____
Charter Bottomfish Trips	____	____
Recreational/subsistence Bottomfish Trips	____	____
Other **Commercial** Fishing Trips	____	____
Other **Charter** Fishing Trips	____	____
Other **Recreational/Subsistence** Fishing Trips	____	____
Mixed purpose **Fishing** Trips	____	____
Any other types of Trips??? (e.g., passenger cruises, diving, please explain what these are)	____	____
Total MHI trips	____ 1993	____ 1992
Total trips for *this* boat	____ 1993	____ 1992

Is this 1993 projection significantly different from what you did in 1992?

In what way?

Do family members usually go on non-commercial trips?

Is this boat also used in other permit fisheries (longlining)?

What percentage of your personal family income does **commercial bottom fishing** from this vessel provide?

{Family income in this case includes additional income you earn from another job or business, your spouse's income, and any additional income which supports your household.}

What percentage of your personal family income do the following uses of this vessel provide?

Charter bottomfish

Other commercial fishing

Other charter trips

Other non-fishing trips

Do you have additional major sources of income? *Yes/No*
(e.g., rental property, another business)

If **YES**, please specify:

What percentage of your personal work time does commercial bottom fishing from this vessel provide? _____%

How many hours a month is this?

OR How many hours per fishing week?
and how many weeks fishing per year?

What percentage of your personal work time does other commercial or charter fishing from this vessel provide? _____%

How many hours a month is this?

OR How many weeks per year?
and how many weeks fishing per year?

What percentage of your personal non-work time does fishing from this vessel provide? _____%
(e.g., recreation)

How many hours a week is this? _____
hours per week

OR How many weeks per year? _____
weeks per year

Do you have another job other than commercial fishing on this vessel? *Yes/No*

If **YES**, please indicate what that job is:

How many hours a week (on average) do you work at this other job? (i.e, part-time or full-time?)

OR, How many weeks per year do you work at this other job? and how many hours per week? (i.e, part-time or full-time?)

Did you used to have another job other than commercial fishing? *Yes/No*

If **YES**, please indicate what that job was:

Also, when was the last year you did that kind of work:

How many years have you been involved with fishing?

How many years have you been fishing **commercially**?

Would you say that you are making a decent living operating this fishing vessel? *Yes/No*

Did you show a profit from this vessel on your tax return last year? (1992, filed in 1993) *Yes/No*

Would you sell this vessel if you could? *Yes/No*

If yes, why haven't you?

Would you replace this vessel with another? *Yes/No*

... for the Mau Zone bottomfish fishery? *Yes/No*

... for the Ho'omalu Zone bottomfish fishery? *Yes/No*

... for another Hawaii fishery? *Yes/No*

What are your primary motivations for operating this fishing vessel?

{Please check each primary motivation, with two checks for the most important motivation.}

Absentee owner:		Owner/operator:	
Primary source of income	___	Primary source of income	___
Source of additional income	___	Source of additional income	___
Long-term investment goals	___	Long-term investment goals	___
No other source of income	___	No other source of employment	___
Long-term family tradition	___	Long-term family tradition	___
Tax write off	___	Tax write off	___
Plan to operate it myself	___	Enjoy the lifestyle	___
Cover a portion of fixed costs	___	Cover a portion of fixed costs	___
Other (specify)	___	Other (specify)	___

PROPOSED POLICY CHANGES:

What do you think would be the best way to manage the bottomfish fishery?

These are alternatives currently under consideration, what do you see as the pros and cons of each plan?

- Limit entry to Mau Zone
  Entry criteria?

- Combine Mau and Ho'omalu Zones

- Make permits transferable

- No change

What are the biggest problems or issues for you personally concerning this operation?

What are the biggest problems or issues which you see for the NWHI fishery?

DEMOGRAPHICS:

What year were you born? _____
Year

Did you grow up in Hawaii? *Yes/No*

If **NO**, did you grow up in a seacoast area? *Yes/No*

Were any of your close relatives a commercial fisher? *Yes/No*
(e.g. father, mother, uncle, older brother)

On which island do you live? _____
Island

What is your ethnic background?

Appendix B - Cross Correlations of All Variables

VARIABLE:	Length	Beam	Fuel Capacity	Range	Hold Capacity	Number of Crew	Average Catch Per Trip	Fishing Days Per Trip	Days Per Trip	Average Catch Per Fishing Day	Maximum Number of Trips Per Year	Projected Maximum Catch	Zone
Length		0.6836	0.7304	0.9166	0.7417	0.7297	0.5574	0.5401	0.5942	0.4234	(0.4562)	0.5000	(0.6020)
Beam	0.6836		0.7512	0.8518	0.8862	0.6178	0.8048	0.8280	0.8145	0.7257	(0.6483)	0.7786	(0.7966)
Fuel Capacity	0.7304	0.7512		0.8986	0.5886	0.3323	0.3781	0.5333	0.4633	0.2074	(0.5132)	0.2855	(0.4503)
Range	0.9166	0.8518	0.8986		0.8522	0.9474	0.6636	0.6217	0.6681	0.5261	(0.5668)	0.5875	(0.6866)
Hold Capacity	0.7417	0.8862	0.5886	0.8522		0.7970	0.9172	0.8810	0.8846	0.8606	(0.6035)	0.8903	(0.8849)
Number of Crew	0.7297	0.6178	0.3323	0.9474	0.7970		0.6476	0.5746	0.7377	0.6888	(0.4194)	0.6755	(0.5417)
Avg. Catch /Trip	0.5574	0.8048	0.3781	0.6636	0.9172	0.6476		0.9522	0.9351	0.9405	(0.6984)	0.9573	(0.9760)
Fishing Days /Trip	0.5401	0.8280	0.5333	0.6217	0.8810	0.5746	0.9522		0.9248	0.8115	(0.6672)	0.9101	(0.9402)
Days /Trip	0.5942	0.8145	0.4633	0.6681	0.8846	0.7377	0.9351	0.9248		0.8520	(0.6635)	0.9157	(0.8969)
Avg. Catch/Fishing Day	0.4234	0.7257	0.2074	0.5261	0.8606	0.6888	0.9405	0.8115	0.8520		(0.5897)	0.9243	(0.8549)
Max # Trips /Year	(0.4562)	(0.6483)	(0.5132)	(0.5668)	(0.6035)	(0.4194)	(0.6984)	(0.6672)	(0.6635)	(0.5897)		(0.5041)	0.6533
Projected Max Catch	0.5000	0.7786	0.2855	0.5875	0.8903	0.6755	0.9573	0.9101	0.9157	0.9243	(0.5041)		(0.9226)
Zone	(0.6020)	(0.7966)	(0.4503)	(0.6866)	(0.8849)	(0.5417)	(0.9760)	(0.9402)	(0.8989)	(0.8549)	0.6533	(0.9226)	

APPENDIX C - Demographics of Survey Participants

DEMOGRAPHICS: All vessels bottomfishing in the NWHI

Owner operators = 8

Hired captains = 4

Absent owners = 4

	Average	Range
Age? (N = 13)	42	30 - 60
Years commercial fishing? (N = 13)	13	1 - 40

	Yes	No
Fishermen relatives? (N = 13)	38.46% n=5	61.54% n=8
Family work as crew? (N = 14)	14.29% n=2	85.71% n=12

	Oahu	Kauai
Residence? (N = 14)	92.86% n=13	7.14% n=1

	Caucasian	Part-Hawaiian
Ethnicity? (N = 15)	86.67% n=13	13.33% n=2